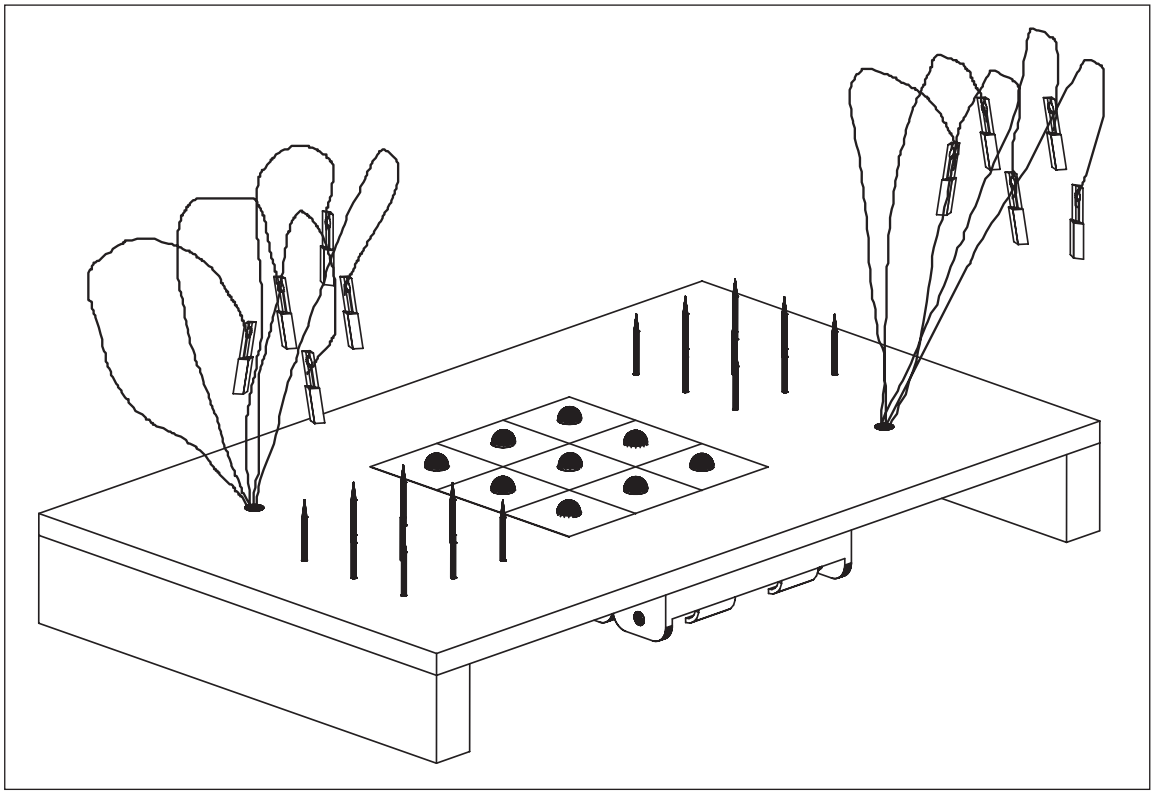
OPITEC

102.001

Electronic noughts and crosses TIC-TAC-TOE



Please Note

The OPITEC range of projects is not intended as play toys for young children.They are teaching aids for young people learning the skills of Craft, Design and Technolo- gy.These projects should only be undertaken and tested with the guidance of a fully qualified adult. The finished projects are not suitable to give to children under 3 years old. Some parts can be swallowed. Dan- ger of suffocation!

1. Product Information

Article: Electronic game in craft pack format

Use: In Design Technology, Key stage 3 -4

2.Material information
2.1 Electronic parts

Insulated wire: Fine multi strand insulated conductor

Resistors: Guides the current flow (large resitance = small flow; smaller resistance = larger flow)
marked and sorted by colour coding: 100Ω = brown–black-brown

International resistor colour code

To identify the correct value of the resistors

Colour ring	1st ring	2nd ring	3rd ring/ multiplier	4th ring/ tolerance
Black	0	0	1	Colour:
Brown,	1	1	10	Brown 1%
Red,	2	2	100	Red 2%
Orange,	3	3	1000	Gold 5%
Yellow,	4	4	10000	Silver 10%
Green,	5	5	100000	None 20%
Blue,	6	6	1000000	
Violet,	7	7		
Grey,	8	8		
White,	9	9		
Gold	-	-	0,1	
Silver	-	-	0,01	

Bi-Colour LED: Light Emitting Diode
Semi Conductor
Connections (3)
Cathode (-) longer leg , flat side
2 Colours: yellow/red, yellow/green or green/red

Battery holder: 2 x AA cells 1.5Volts

Joining connectors: For inserting wiring connections
Silver plated

Working: The components are soldered together
Cut off any protruding legs

Note: Electronic components can be damaged by heat.
(Use a pair of pliers as a heat sink)

Finish: Electronic components do not need a special finish

2.2 Material: nails /drawing pins

Working: Soldering

Joining: Inserting connectors , soldering

Finish: none necessary

2.3 Material:

Plywood; 3 layers
Each layer has the grain in the opposite direction
Pine (Coniferous) softwood
Wood should be relatively dry before working

Working: Wood must be sawn, shaped, drilled and sanded
Mark out according to patterns or measurement

Joining: PVA glue (White)

Finish: Wax (liquid or solid)
Wood varnish (Basecoat and top coat)
Staining (Colour, water soluable)
Linseed oil

3. Tools

Soldering: You will need a 15-30W soldering iron for electronic work

Cutting: Use side cutters to trim the electronic components

Saws: Use a fine toothed saw for all straight cuts and dowel

Note: Hold the work tightly when sawing

Files: Use the correct grade of wood file or rasp according to the work in hand

Note: Files only cut on the forward stroke

Sanding: Use a block and glasspaper on flat surfaces and loose sheet on curves

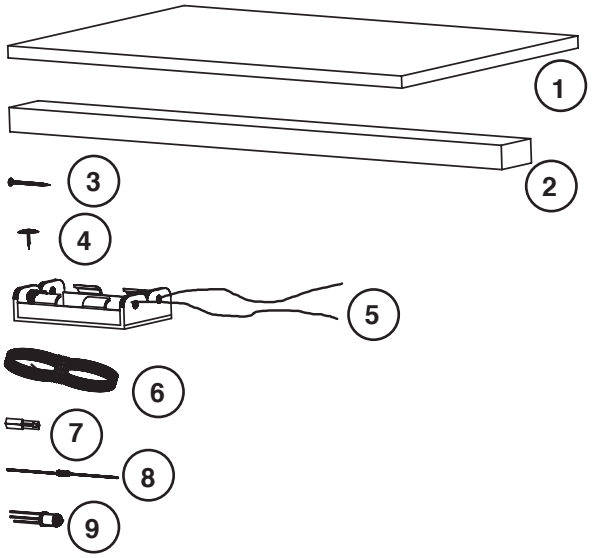
Holding: Use G Glamps or similar to hold the work whilst the glue is drying

Drilling: Use a hand or a pillar drill for making holes

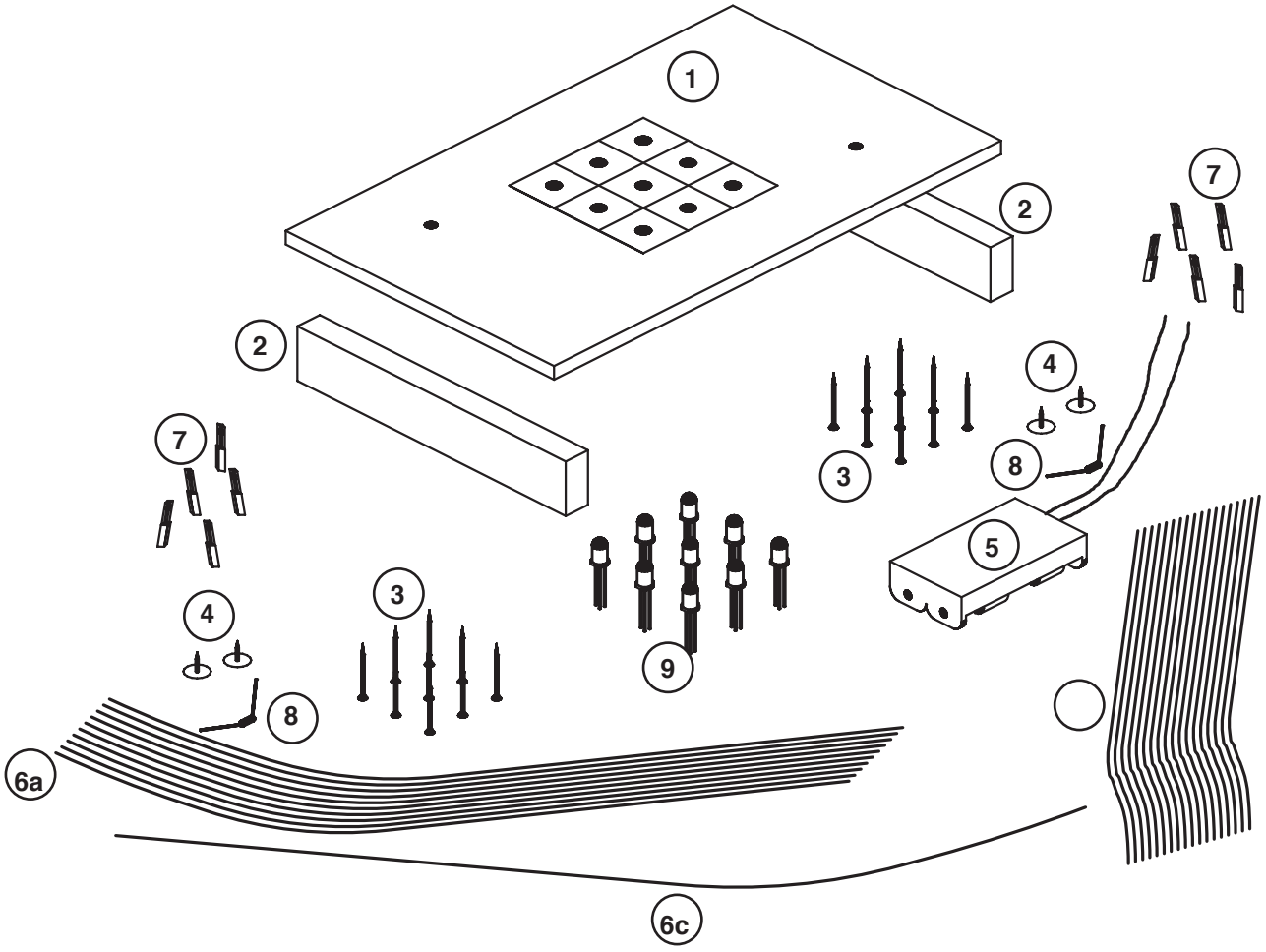
Note: If using a power tool: tie all long hair back, remove rings and jewellery
Wear safety glasses and an apron
Hold the work with clamps or a machine vice

4. Parts list:

Part	Material	Quantity	Size in mm	Diagram
Game area	Plywood	1	5 x 120 x 200	
Side parts	Pine	1	10 x 20 x 250	
Contact nails	Metal	20	15	
Contacts	Metal	4		
Battery holder	Plastic	1	2xMignon	
Insulated wire	red and black	2	2000	
Contact sleeves	Metal, silver plated	10		
Resistor		2	100 Ω	
Bi-Color-LEDs		9	ø 5	



5. Exploded diagram



6. Planning overview

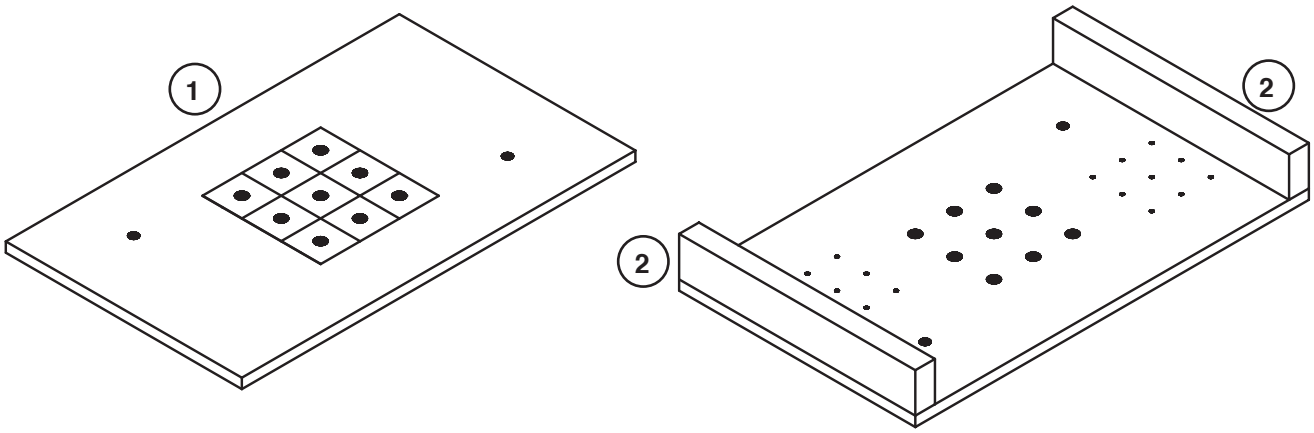
6.1 Making the playing area

6.2 Constructing and wiring the circuits

6.3 Testing the finished project

6.1 Making the playing area

6.1.1 Mark out the playing field (see page 9) on the plywood sheet (1). Drill the holes 4 and 5mm as shown and then ink in the outlines of the game with an Edding pen or similar



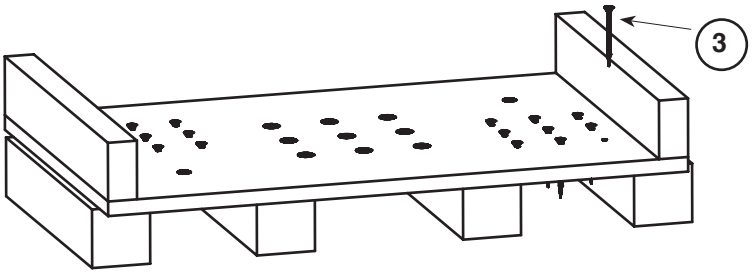
6.1.2 mark out on the reverse side of the top the position of the contact pin (Use a fine hole marking tool)

6.1.3 Cut two lengths 120mm long from the pine strip (2) and sand the ends. Glue them in position as shown in the diagram

6.2 Constructing and wiring the circuits

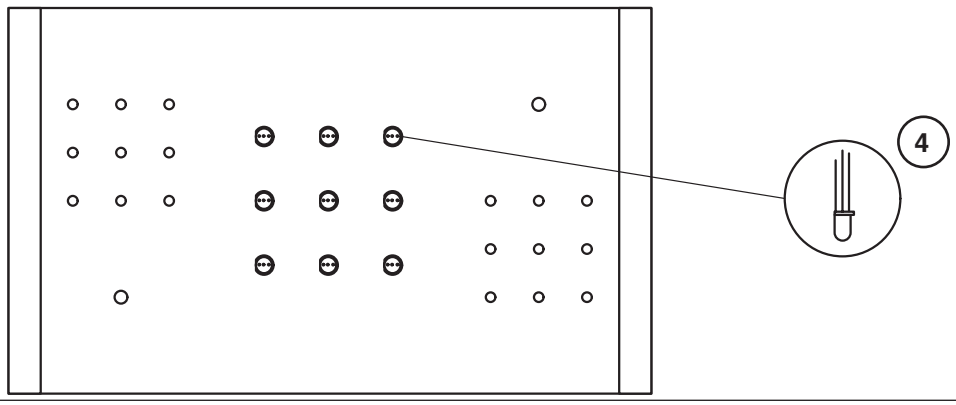
6.2.1 Insert the contact pins (3) into the reverse of the plywood board

Note: Make sure that the contact pins are upright and are equally spaced
Use two blocks of wood as supports or hold it in between vice jaws so that the pins can be easily driven unhindered through the plywood sheet



6.2.2 Insert and glue the LEDs with a flattened side to the left in the 5mm holes

Note: for gluing use an all purpose glue



6.2.3 From both lengths of insulated wire (6) red and black cut 5 pieces ca. 150mm long (6a) and remove the insulation from the ends

6.2.4 Tin both ends of each piece of wire (6a) and solder on a connector (7)

6.2.5 Glue the battery holder (5) underneath as shown

6.2.6 Insert 2 drawing pins near the 4mm near the battery holder (See diagram below)

Note: make sure that the pins do not protrude through the top

6.2.7 Tin the nails and drawing pins with solder
Solder a 100Ohm resistor (8) between the drawing pins

6.2.8 Wiring:

- Solder a lead from the plus pole on the battery holder (red cable) to drawing pin A
  Take a lead (200mm) from this drawing pin to (6c strip both ends and tin) drawing pin C

- Bend the Cathode leg s on the LEDs (Minus poles on LEDs) forward and solder them together (See thick line on the plan)

- Join lead from the minus pole on the battery holder (Black cable, thick line on plan) to a cathode connection on the LEDs

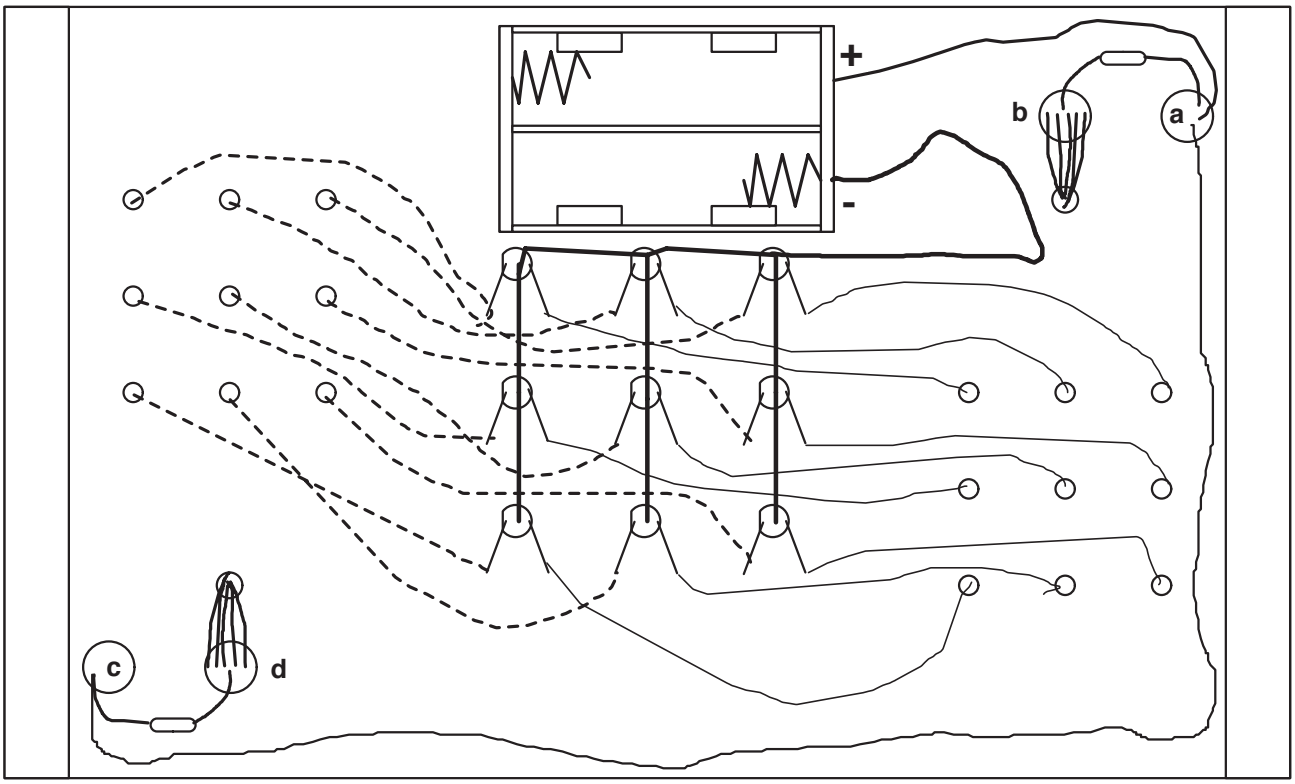
- Now take 5 lengths of cable, solder on end connectors (6a/7) thread them through the 4mm hole from the top and solder them to the drawing pins (b/d)

Note: The connectors are on the top!

- Cut 9 pieces from each colour length of wire 80mm (6b) strip the ends tin
  Now systematically solder a wire (6b) from a nail head on the left hand side to a left hand (Anode) on the LEDs . Then repeat the same procedure on the right hand side

Note: be careful not to mix up the rows and connections!!!

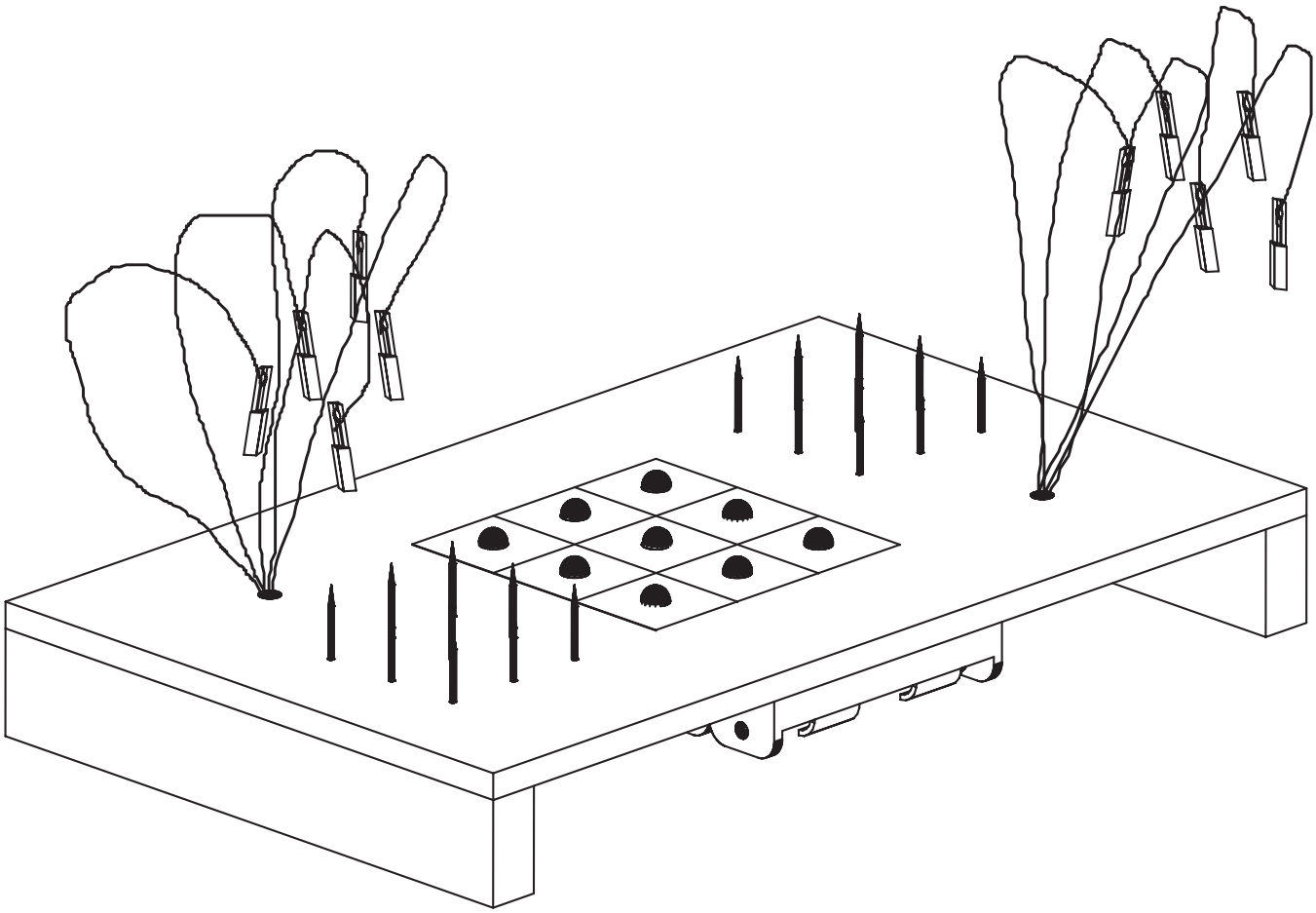
6.2.9 A drop of all purpose glue on the nail heads will prevent them being pressed back through as the connections are made



6.3 Function test

6.3.1 Insert two AA batteries (not included) into the battery holder

6.3.2 Firstly join every connection on one side with a nail Now all the LEDs should light up in the same colour in the order the connections are made
Should this not happen you will have to check the connection and soldering joints back to the LED etc
Test each part of the circuit in turn



Rules of the game

Each player must try to get 3 LEDs in a row to light., whether vertical,horizontal, or diagonal
Whoever is the first to achieve this is the winner. Player A,s LED will light up red and the opposition, player B yellow. The rest is a tactical game of play and check.

Pattern

Scale 1 : 1